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(54) **Communications receiver employing a prepaid identity card.**

(57) A communications receiver, such as a radiopager (10), has a socket (22) into which a device, such as a card (24), can be inserted in order to load into the receiver data relating to its operation. The data may comprise a radio identity code (RIC) and prepaid credit units which are cancelled by the receiver as they are spent. Additionally the data may relate to frequency and data rate information which is usable by the receiver to adapt it to be able to receive messages transmitted by the respective paging system. Once the data has been loaded in the device it is removed from the receiver and is either discarded or re-used after having the credit units recharged on payment of a fee.

The receiver may be adapted to any one of a number of paging systems by simply inserting the appropriate card (24) and loading in the operating information, RIC and credit units embedded in it. A user can roam from country to country and by downloading the relevant information from an insertable card be able to adapt his receiver to the local paging system and pay for his usage of his receiver as he goes.

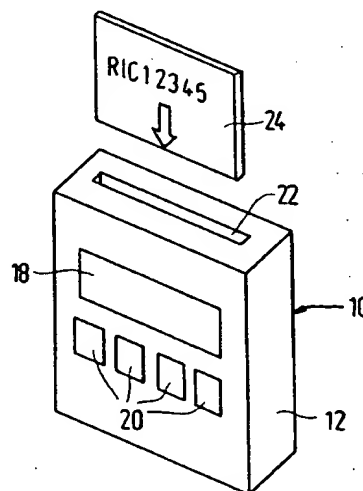


FIG.1

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The present invention relates to a communications receiver for receiving messages, such as a radiopager. In the present specification the term radiopager is intended to cover a communications receiver for receiving an address codeword only or an address codeword together with concatenated data message codewords. Normally such receivers are not able to transmit signals although what is termed answer-back radiopagers are becoming available. For convenience of description, the present invention will be described for use in a POCSAG or CCIR Radiopaging Code No. 1 system details of which are disclosed in "The book of the CCIR Radiopaging Code No. 1" available from Secretary RCSG, British Telecom, Radiopaging, 23 Howland Street, London, W1P 6HQ, United Kingdom. However the teachings of the present invention are not system dependent and could readily be applied to radiopagers operating in accordance with the Golay or ERMES radiopaging protocols.

In the United Kingdom, POCSAG digital radiopaging services are provided by several network providers. However service providers supply radiopaging receivers to the end user and also bill the customer at periodic intervals say every 3 months. When supplying a radiopager, a service provider writes a radio identity code (RIC) or address in a non-volatile store included in the radiopager. The RIC uniquely links the radiopager with the particular user. Thus in operation if the radiopager detects the transmission of its RIC in the relevant predetermined frame of a batch, it remains energised to provide an audio, visual and/or tactile alert indication to the user and where appropriate it will store message data which is concatenated with its address codeword. Also the service provider will adjust the receiver to receive signals in the relevant frequency channel, the bit rate being already predetermined by the POCSAG protocol. The radiopager as delivered to the end customer is then able to operate within the receiving range of the transmitters operated by a predetermined network provider.

At the present time many countries have their own national digital paging systems based on POCSAG. However because of the likelihood of the same RIC being issued to a different pager in each country and each country operating its paging system on a different frequency or frequencies it is not usually possible for a user to take say a normal UK digital radiopager to another country operating the POCSAG system and use it there. Furthermore no arrangements currently exist for billing users who cross national boundaries.

A number of PTTs and other network providers in Europe operate Euromessage which is one attempt to provide a degree of international paging coverage within certain parts of Europe, primarily

the major cities. Euromessage operates on a single frequency at UHF and requires a user to hire a radiopaging receiver from a service provider, and also requires the user to indicate, several weeks in advance of his departure, those countries in which the user wishes to be paged. Drawbacks to Euromessage are that it is relatively inflexible, it is not comprehensive in its coverage of the respective countries and it requires a user to have to carry a second radiopaging receiver in addition to that usable in his home country.

An object of the present invention is to provide more flexibility in the use of radiopagers.

According to one aspect of the present invention there is provided a communications receiver having means for receiving and loading-in data relating to the operation of the receiver from a device removably insertable into the receiver.

According to a second aspect of the present invention there is provided a device for use with the receiver in accordance with the present invention, characterised in that it comprises storage means containing data relating to the operation of a receiver.

In one embodiment of the present invention the radiopager is a standard receiver which has not had a RIC embedded in it by a service provider. However the device, which may comprise a card, stores a RIC which is assigned to the card together with credit information comprising prepaid credit units. By inserting the card into the radiopager the RIC together with the credit units are loaded into respective storage locations in the radiopager which confirms that the information has been received. The card which has been erased is then withdrawn. A user has then to inform his office of the new RIC or access code, which may be printed on the card, in order that he can be paged. The prepaid credit units are debited in accordance with the usage of the radiopager, which usage might be related to the number of paging calls addressed to, and received by, the radiopager or the period(s) of time when the radiopager is available to receive paging calls. When the credit units have been exhausted then the user has a number of options, for example to obtain a new card with its own RIC or access code and prepaid credit units, to take the original card to a suitable office or a shop where the credit units are recharged on payment, or to have a supply of cards having the same RIC or access code and prepaid credit units. The use of such cards with radiopagers means that both items can be obtained from any suitable retail outlet and not just from an established service provider. Additionally because the credit units are prepaid then the service provider is relieved of the job of billing the user at regular intervals.

In another embodiment of the present invention

the radiopager is capable of adapting its operating characteristics such as its frequency and, if applicable, its data rate in response to information loaded into it from a suitable card which has stored in it not only such information but also a RIC and prepaid credit units. When such information is loaded in then the radiopager is adapted to receive calls from a paging system operating in a particular area or country.

If the radiopager has sufficient storage then information from two or more such cards can be loaded into the radiopager. The information includes operating characteristics of systems in different geographical areas. When a user is in a particular area, say France, he selects France and the radiopager adapts itself according to the information loaded in from a French card. On crossing into Germany then the user selects Germany and the radiopager adapts itself accordingly. The prepaid credit units associated with one country cannot be used in another country should the credit units for that country be exhausted.

If desired the radiopager may be capable of receiving encrypted messages but in order to decode them the encryption key is required. Such a key may be provided by an insertable card which is erased during the loading of the key into the radiopager. If at the base station, the key used in the encryption is changed then the user of a radiopager has to insert a card having the new key in order to be able to receive paging alerts and/or messages.

The use of prepayment cards, credit cards and bank cards for the payment of telephone calls is known *per se* but such cards do not provide the telephone unit with an identity by which it can receive calls.

It is also known from a conference paper "Smart Card Technology Applied to the future European Cellular Telephone on the digital D-Net-work" read at Smart Card '90 International Exhibition and Conference, PLF Commun, 3 Vol. 332 PP, pages Q1 to Q13, Vol. 2, 1990 that in order for a user to be able to use his GSM radiotelephone it must have a Subscriber Identity Module (SIM) inserted into the telephone in order to be able to operate. A user carrying his SIM with him is then able to roam internationally through the GSM system and make calls via any telephone unit simply by inserting his SIM. Billing is done by debiting the user. A SIM does not provide the possibility of prepayment of credit units to avoid billing, does not have its own RIC as opposed to that of a user and does not adapt the radiotelephone to the radio transmission characteristics of a country in which it is to be used.

The present invention will now be described, by way of example, with reference to the accom-

panying drawings, wherein:-

Figure 1 is a sketch drawing illustrating a radiopager and a device consisting of a card in which is embedded information to be loaded into the radiopager in order to enable it to operate,

Figure 2 is a block schematic diagram of a radiopager, and

Figure 3 is a sketch illustrating one method by which the radiopager can be used in different geographical areas.

In the drawings the same reference numerals have been used to indicate corresponding features.

The radiopager 10 shown in Figures 1 and 2 comprises a housing 12 which contains a radio receiver 14 and a controller 16. A liquid crystal display (LCD) panel 18 is provided in a wall of the housing 12 together with a plurality of push switches 20 which are used to determine various operating modes of the radiopager 10. A socket 22 is provided in a wall of the housing 12 for receiving a device, such as a card 24, which contains a RIC, prepaid credit units and, depending on its application, frequency, data rate and any other information which will be required by the radiopager 10 in order for it to operate. The card 24 is inserted into the socket 22 and the information it contains is loaded into a non-volatile store 26 under the control of the controller 16. The store 26 is electrically alterable and may comprise an EEPROM. The completion of the loading in of the information is confirmed by the radiopager displaying a confirmation message which may contain the RIC, number of credit units and optionally a system or country code on the LCD panel 18.

The radiopager 10 includes a frequency synthesiser 28 which produces a local oscillator frequency which is supplied to the receiver 14. The local oscillator frequency may be varied as required by means of the controller 16. A decoder 30 is connected between an output of the receiver 14 and an input to the controller 16. The purpose of the decoder 30 is to adapt a received paging signal coded according to the specified standard into a form which is suitable for application to the controller 16. A timer 32, LCD drivers 34 and an audio, visual and/or tactile alerting device(s) 36 are connected respectively to the controller 16.

In one mode of operation, a user of the radiopager 10 obtains a card 24 from any suitable retail outlet, which card has a RIC, access code and prepaid credit units embedded in it. The user inserts the card 24 into the socket 22 and the RIC and the number of credit units are loaded into the store 26 and the successful transfer of the information is indicated on the LCD panel 18. The card is then discarded as the information has been erased. Finally, the user then has to inform, say his office

of his current RIC or access code.

In use the radiopager 10 is energised for its respective frame according to the specified standard and if a paging message is received, it is decoded and the address codeword is compared with the current RIC by the controller 16 and if there is a match then the alerting device 36 is energised and, where applicable, any message codewords are stored in a RAM 37. If the debiting is done on a per call basis then the number of credit units is reduced by one after each call received. Alternatively if the debiting is done on a time basis, then when switching on the radiopager 10, the timer 32 increments the time and after a predetermined unit of time has elapsed the controller 16 deducts one credit unit from the number held in the store 26.

When the number of credit units has expired then various options are possible. For example the user goes to a retail outlet and purchases another card which has its own RIC, access code and credit units and the user inserts this card into the socket 22 and loads in the new RIC and the prepaid credit units. He then has to inform say, his office, of his new RIC or access code.

Frequent changes of RICs may be avoided by credit units on the card being rechargeable on payment of a fee or by a batch cards having the same RIC and access code being purchased and held by the user and/or his office.

This simple mode of operation has the advantages that the user can purchase his radiopager and cards from any suitable retail outlet and is not dependent on a service provider who may not be open for business, that billing is avoided and that the user has some control over the cost of operating his radiopager - currently in Great Britain service providers charge monthly fees independent of the degree of usage and number of calls received.

Figure 3 illustrates a mode of use where for example countries A and B have POCSAG digital paging systems which are operated on different frequency channels. In order to be able to use the same radiopager 10 in both countries, the local oscillator frequency produced by the frequency synthesiser 28 must be such as to enable the paging signal to be received. Accordingly the card 24 contains not only a RIC or access code and credit units suitable for the country concerned but also frequency data which the controller 16 can supply to the synthesiser 28 so that it generates the appropriate local oscillator frequency.

Thus when in country A, which will be regarded as the home country, the user purchases a card 24A and loads in the required information which is used to adapt the radiopager 10 accordingly. As before, the user notifies his office of his RIC or access code. Whilst in country A, the user

can be paged by way of a paging system PSA and its associated base stations BS.

When the user travels to country B, he purchases a card 24B and loads in a new RIC or access code, credit units and frequency information for country B and notifies his office in country A of his RIC or access code. The radiopager 10 is now only able to accept paging calls from the paging system PSB in country B, which if they are from his office in country A, are relayed by the paging system PSA and the international PSTN network 38 to the paging system PSB.

Depending on the level of sophistication in the radiopager various implementations are possible to cover a radiopager roaming outside the area of one paging system and into the area of another paging system.

For example when considering Figure 3, the insertion of the card 24B can erase not only the RIC but also the unused credit units due to country A and vice versa when a subsequent card 24A is inserted.

Alternatively if the store 26 is large enough it may be able to store simultaneously RICs, credit units and frequency information on a per country basis and when a user arrives, or prior to his arrival, in a country either he buys a card and loads the information into his radiopager 10 or if such information is already stored and there are unused credit units, he uses the push switches 20 to select operation for the country concerned.

In a further refinement, if the radiopager has been preloaded with information relating to two or more countries and is in credit, then the controller 16 can by adapting the receiver characteristics on an empirical basis automatically set the radiopager up for receiving paging messages from the local paging system in the country concerned.

Credit units are stored on a per paging system basis and only debited when used on that system. For example, credit units for use on system PSB (Figure 3) cannot be used in the event the radiopager 10 operating on the system PSA and exhausting the number of credit units it has for that system.

A practical problem which may occur when using RICs embedded into cards is one of how long an interval should be allowed to elapse before issuing a card with an identical RIC. This problem can occur because there is a large but finite number of RICs and therefore the number of cards with different RICs is not limitless. If the same RIC has been issued two or more times and the respective radiopagers are in credit then without some precautions being taken a paging request can be accepted by the pager system for anyone of them and its transmissions can be received by all those pagers having the same RIC.

One method of reducing the incidence of multiple transmissions is for the card to be limited to a certain life, say 6 months or to a predetermined number of paging messages, say 100 messages, after which time or number of messages its registration at the paging system terminal is deleted.

A method by which the registration is deleted after a predetermined period of time will now be described. The card includes a RIC, an access code and a registration number. When the user purchases a new card he loads in the pager specific RIC and other information as described previously. At that point in time, the timer 32 (Figure 2) has not been set and can only be set by the user registering with the paging system by telephoning the registration number and giving the RIC or access number. The pager system then sends an initiating paging message to the radiopager 10 on the new RIC. The radiopager 10 will respond only to the initialising message, and on receipt of this message the timer 32 begins to count for a predetermined duration, say 6 months. At the same time the paging system records the time it sent the initiating message. At the end of the predetermined duration the paging system refuses to accept any more calls for that RIC or access number and also the radiopager 10 can indicate that its current RIC has expired. The system can now sanction the issuing of another card having the same RIC.

In the case of the authorisation of a predetermined number of calls, then the paging system monitors the number of paging calls which have been transmitted. To be viable, the authorisation will also contain a time restriction such as 100 calls in 6 months.

This method may not prevent a pager which has still the same RIC as has been reissued subsequently from receiving pages meant for someone else who also has that RIC. However this problem can be overcome by the timer erasing the RIC stored in the controller 16 so that it cannot receive anything except a specific initiating message after insertion of new/updated card data.

Another use for information stored on an insertable card is to decrypt encrypted messages by the card having the currently used encryption key which is loaded into the radiopager. If the paging system changes the encryption key monthly then new cards will have to be issued monthly if the user is to continue to be able to decrypt encrypted messages sent to his radiopager.

From reading the present disclosure other modifications will be apparent to persons skilled in the art. Such modifications may involve other features which are already known in the design, manufacture and use of radiopagers and component parts thereof and which may be used instead of or in addition to features already described herein.

Although claims have been formulated in this application to particular combinations of features, it should be understood that the scope of the disclosure of the present application also includes any novel feature or any novel combination of features disclosed herein either explicitly or implicitly or any generalisation thereof, whether or not it relates to the same invention as presently claimed in any claim and whether or not it mitigates any or all of the same technical problems as does the present invention. The applicants hereby give notice that new claims may be formulated to such features and/or combinations of such features during the prosecution of the present application or of any further application derived therefrom.

Claims

1. A communications receiver having means for receiving and loading-in data relating to the operation of the receiver from a device removably insertable into the receiver.
2. A receiver as claimed in claim 1, characterised in that said device contains a radio identity code and in that the receiver comprises means for storing the radio identity code and for treating said radio identity code as the current address of the receiver.
3. A receiver as claimed in claim 1 or 2, characterised in that said device contains information pertaining to the frequency and radio protocol being used in a specific geographical area and in that the receiver has means for storing the frequency and radio protocol information and means for adapting the receiver in response to said stored information.
4. A receiver as claimed in any one of claims 1 to 3, characterised in that said device contains prepayment information relating to the permitted usage of a receiver, and in that the receiver has means for crediting the receiver in accordance with said prepayment information and means for debiting the credited information in accordance with the usage of the receiver.
5. A receiver as claimed in any one of claims 1 to 4, characterised by decrypting means for use in decoding encrypted signal and characterised in that said device contains the encryption key which is loaded into the receiver.
6. A receiver as claimed in any one of claims 1 to 5, characterised by non-volatile memory means for storing data loaded in from said

device.

7. A device for use with the receiver as claimed in any one of claims 1 to 6, characterised in that it comprises storage means containing data relating to the operation of a receiver. 5
8. A device as claimed in claim 7, characterised in that the data comprises a radio identity code. 10
9. A device as claimed in claim 7 or 8, characterised in that the data comprises prepayment (or credit) units. 15
10. A device as claimed in claim 9, characterised in that the device comprises alterable means whereby prepayment units are recharged. 20

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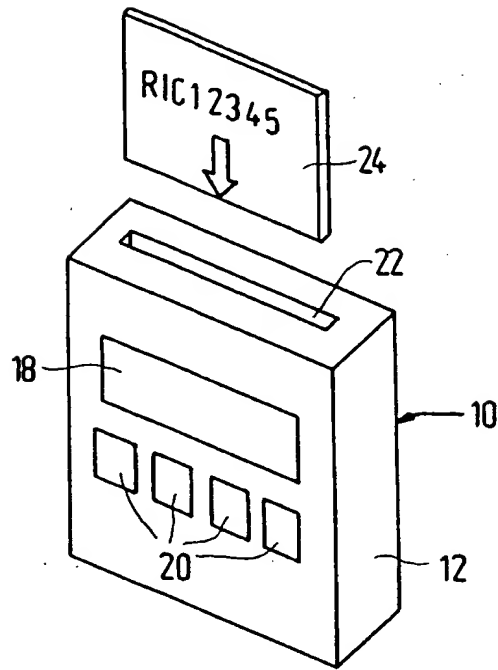


FIG. 1

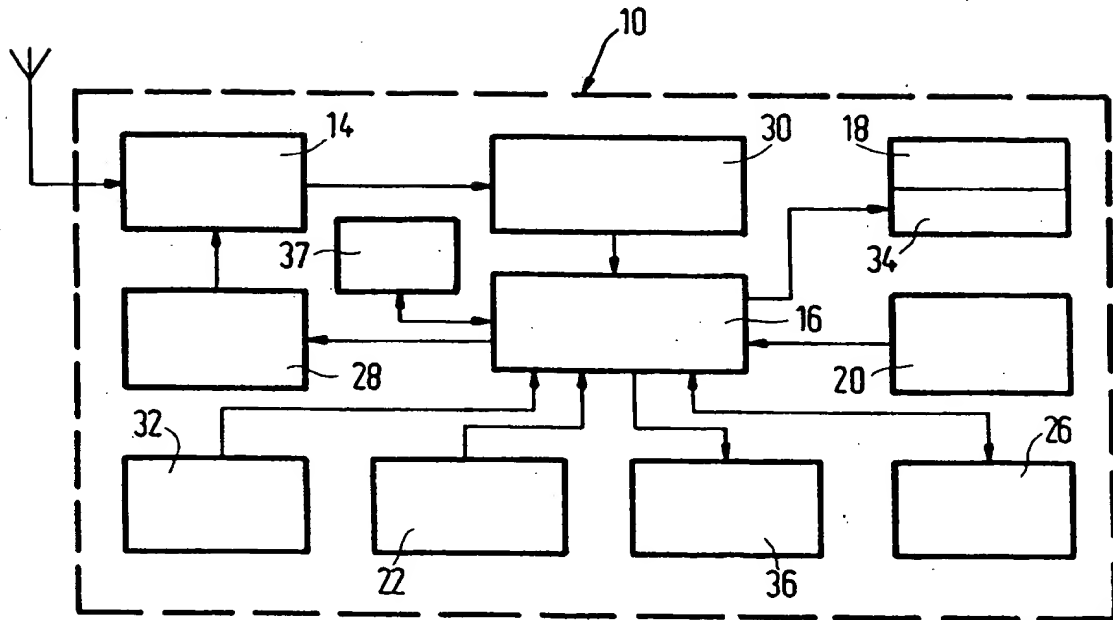


FIG. 2

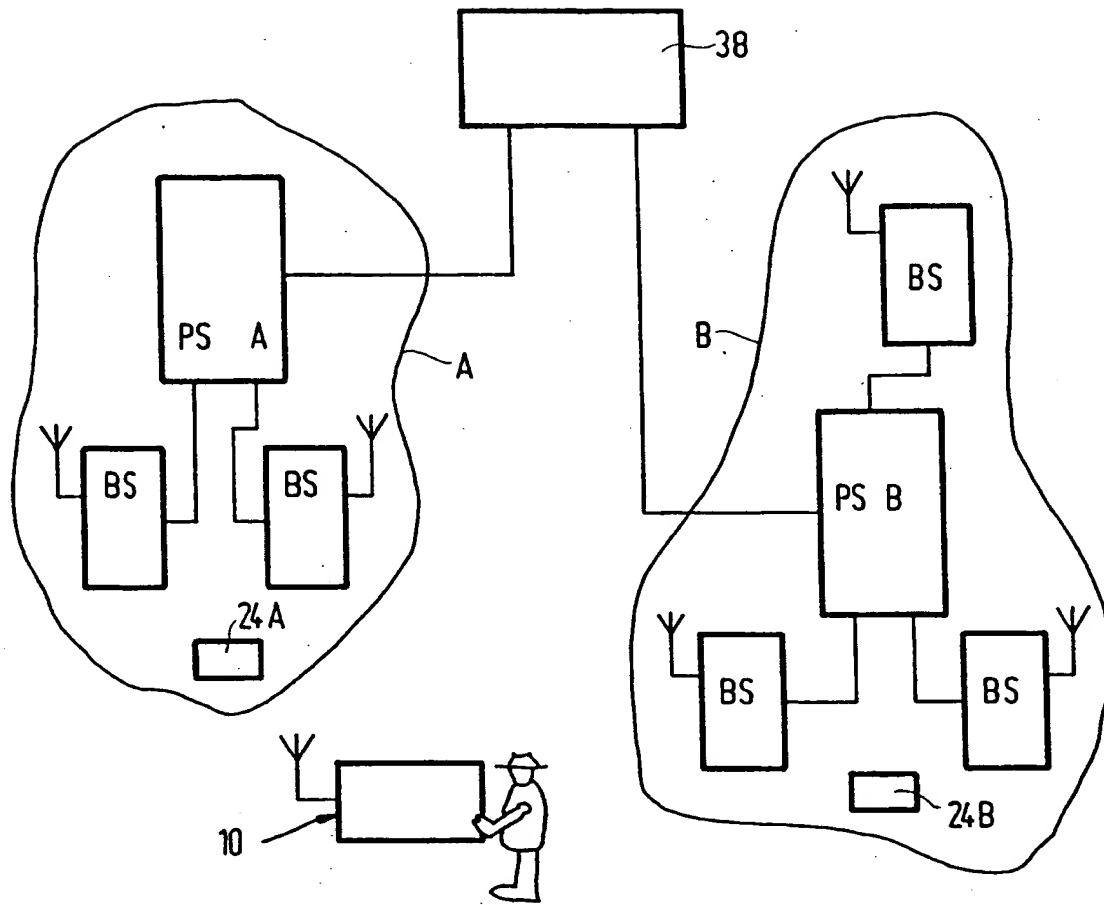


FIG.3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 20 3080

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	PATENT ABSTRACTS OF JAPAN vol. 14, no. 2 (E-868)8 January 1989 & JP-A-12 51 927 (NEC CORPORATION) * abstract *	1,2,7,8	H04Q7/02 H04B1/08
Y	---	3,4	
X	GB-A-2 211 050 (THE GENERAL ELECTRIC COMPANY PLC) * page 7, line 11 - line 13 * * page 6, line 23 - line 27 * * abstract *	7,9,10 4 5,8	
Y	---		
A	EP-A-0 360 228 (CASIO COMPUTER COMPANY LIMITED) * abstract * * column 7, line 35 - column 8, line 2 * * column 24, line 22 - line 40 * * column 28, line 46 - line 49 *	1-10	
Y	MOTOROLA TECHNICAL DEVELOPMENTS vol. 11, October 1990, SCHAUMBURG, ILLINOIS US page 67, XP178624 HOLMES ET AL 'multiple programmable frequencies / codes / coding protocols / associated options user selectable coverage areas' * the whole document *	3	TECHNICAL FIELDS SEARCHED (Int. Cl.5) H04Q G07F H04B
Y	---		
A	GB-A-2 207 269 (SMITH METERS LIMITED) * abstract * * page 3, line 12 - line 13 * * page 3, line 25 - line 29 *	4 9,10	

The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 21 JANUARY 1993	Examiner GOULDING C.A.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	

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